



Driving Indiana's Economic Growth

Addressing the High Cost of Poor Traffic Operations

Traffic Signal Operations

Ryan Gallagher—INDOT Div. of Traffic Control Systems



Traffic Signal Report Card

D-



Traffic Signal Report Card



- Just because signals are “working” ... doesn’t mean they are **WORKING**.



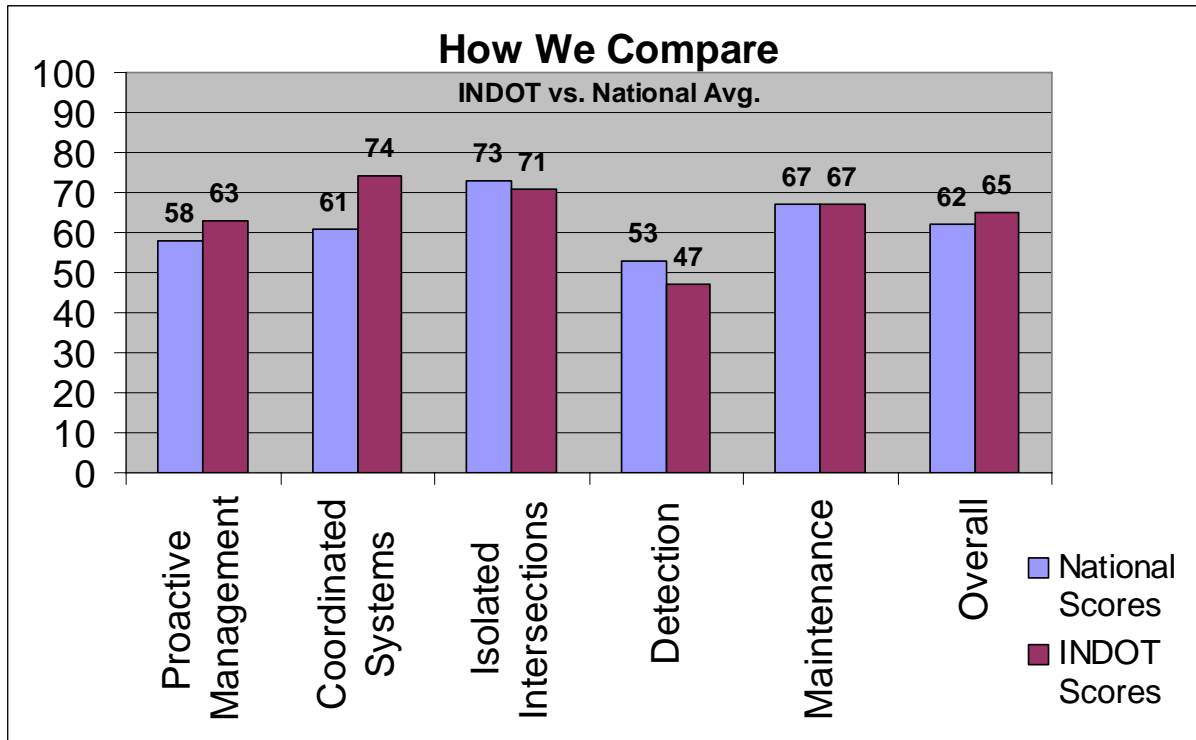
Best Practices

- Do the work proactively...AND...



Best Practices

- ...measure the work you do.



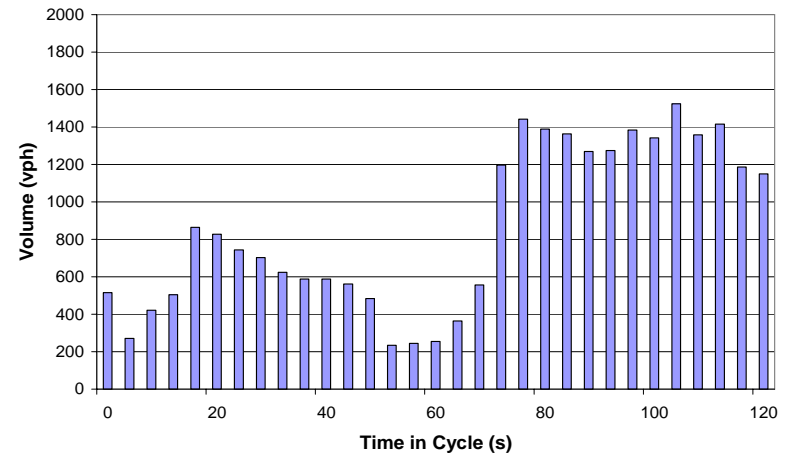
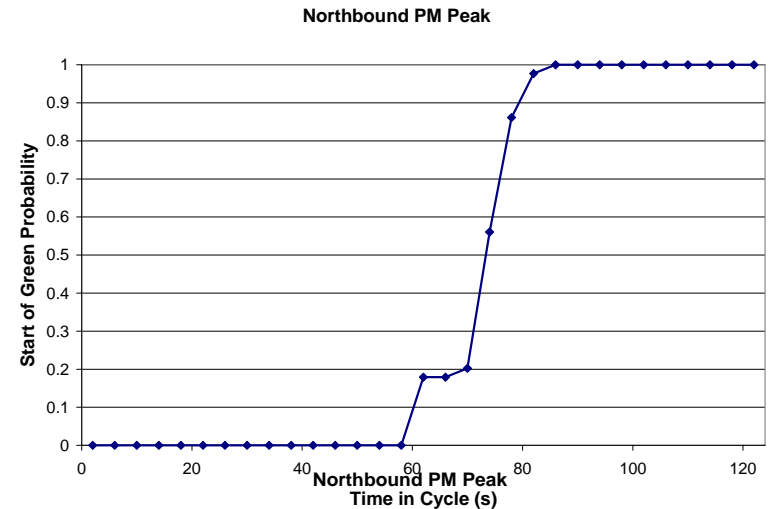
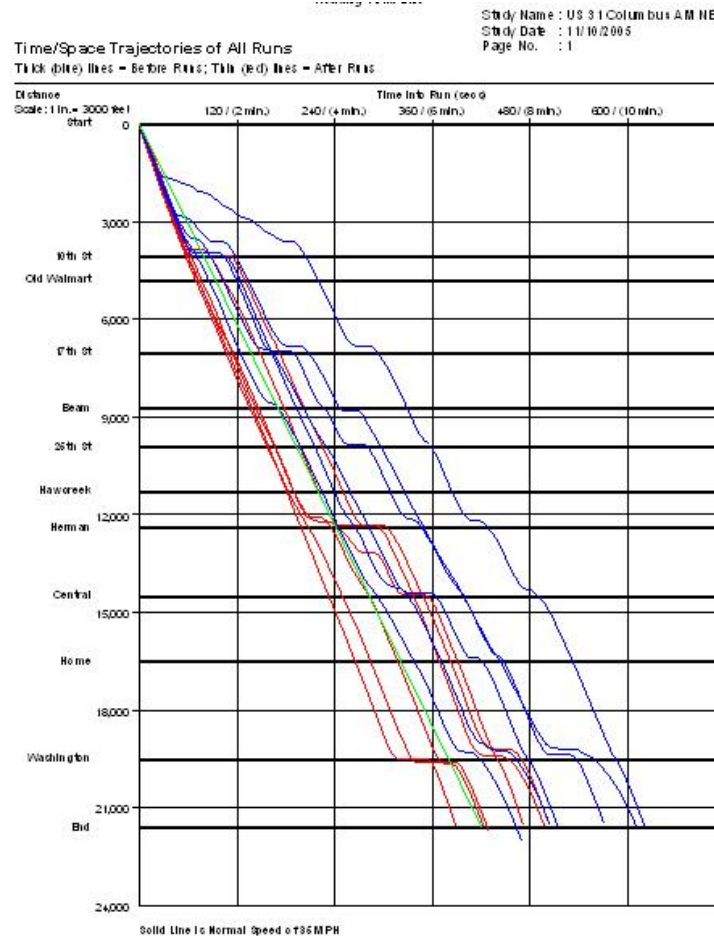
Work Proactively...

- INDOT chose a time based model...for now
 - Operational Performance Index

Crawfordsville District										
Period 1 starts:	1/1/2007									
# Signals				Pace (years)	5.5	5	4.5	4	3.5	3
275				Signals/P	25.00	27.50	30.56	34.38	39.29	45.83
OPI Score										
Period	Starts	0	1	2	3	4	5	6	Completed This Q	Cumulative Score
1	Jan-07	< 25	25	28	31	35	40	46	40	40 5
2	Jul-07	< 50	50	55	62	69	79	92	25	65 3
3	Jan-08	< 75	75	83	92	104	118	138	34	99 3
4	Jul-08	< 100	100	110	123	138	158	184	49	148 4
5	Jan-09	< 125	125	138	153	172	197	230		
6	Jul-09	< 150	150	165	184	207	236	275		
7	Jan-10	< 175	175	193	214	241	275	321		
8	Jul-10	< 200	200	220	245	275	315	367		
9	Jan-11	< 225	225	248	275	310	354	413		
10	Jul-11	< 250	250	275	306	344	393	459		
11		< 275	275	303	337	379	433	505		
12		< 300	300	330	367	413	472	550		
13		< 325	325	358	398	447	511	596		
14		< 350	350	385	428	482	550	642		
15		< 375	375	413	459	516	590	688		
16		< 400	400	440	489	550	629	734		
		0	1	2	3	4	5	6		



Measure your work--Operationally



Measure your work--Managerially

Cost Summary									
Equipment Costs			\$0.00						
In-house Labor			\$9,905.06						
Outside Services			\$0.00						
Total Costs			\$9,905.06						
Benefit Summary									
Fuel volume saved(gal/yr)			6003		5481				10701
Fuel cost/gal			\$2.56		\$2.56				\$2.56
Total fuel savings			\$15,367.68		\$14,031.36				\$27,394.56
Total Fuel Savings/yr.			\$56,793.60						
Time savings per year (hrs.)			5220.0		6786				18792
Value of time (\$/hr.)			\$14.54		\$14.54				\$14.54
Occupancy Factor			1.56		1.56				1.56
Time Savings/yr.			\$118,436.00		\$153,966.81				\$426,369.62
Total Time Savings/yr.			\$698,772.43						
Benefit/Cost Ratio			76.3						



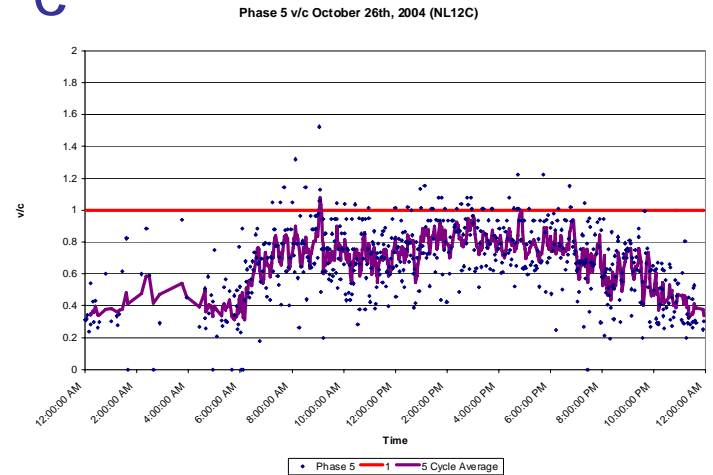
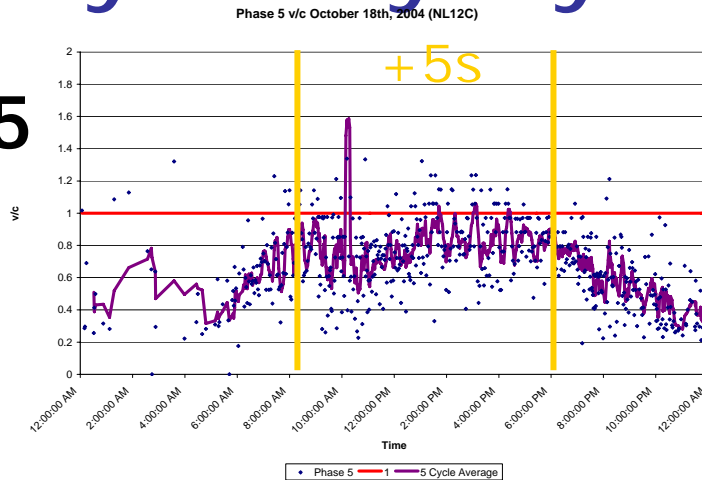
Work Proactively

- Time based “for now”—what’s next?
- Make the decision on how the system is operating...not an arbitrary time value.
 - Some systems may need evaluated every 2 years.
 - Other systems possibly every 10 years.
- RECAP from last year...

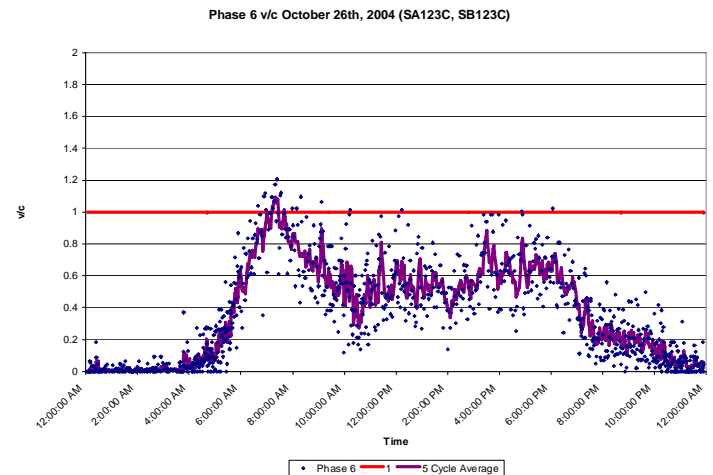
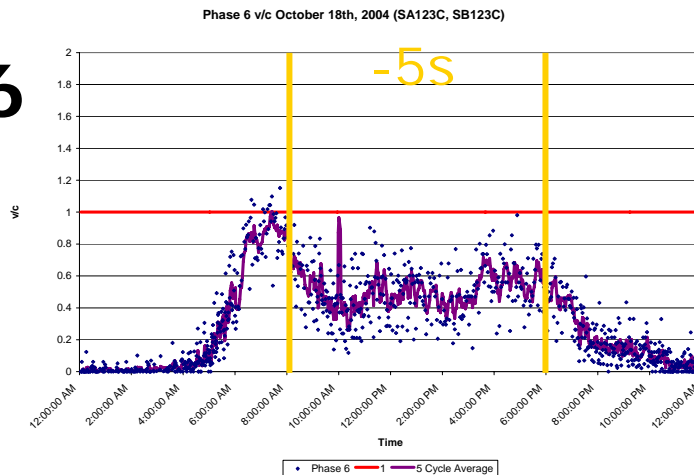


Cycle by Cycle v/c

Ø5



Ø6

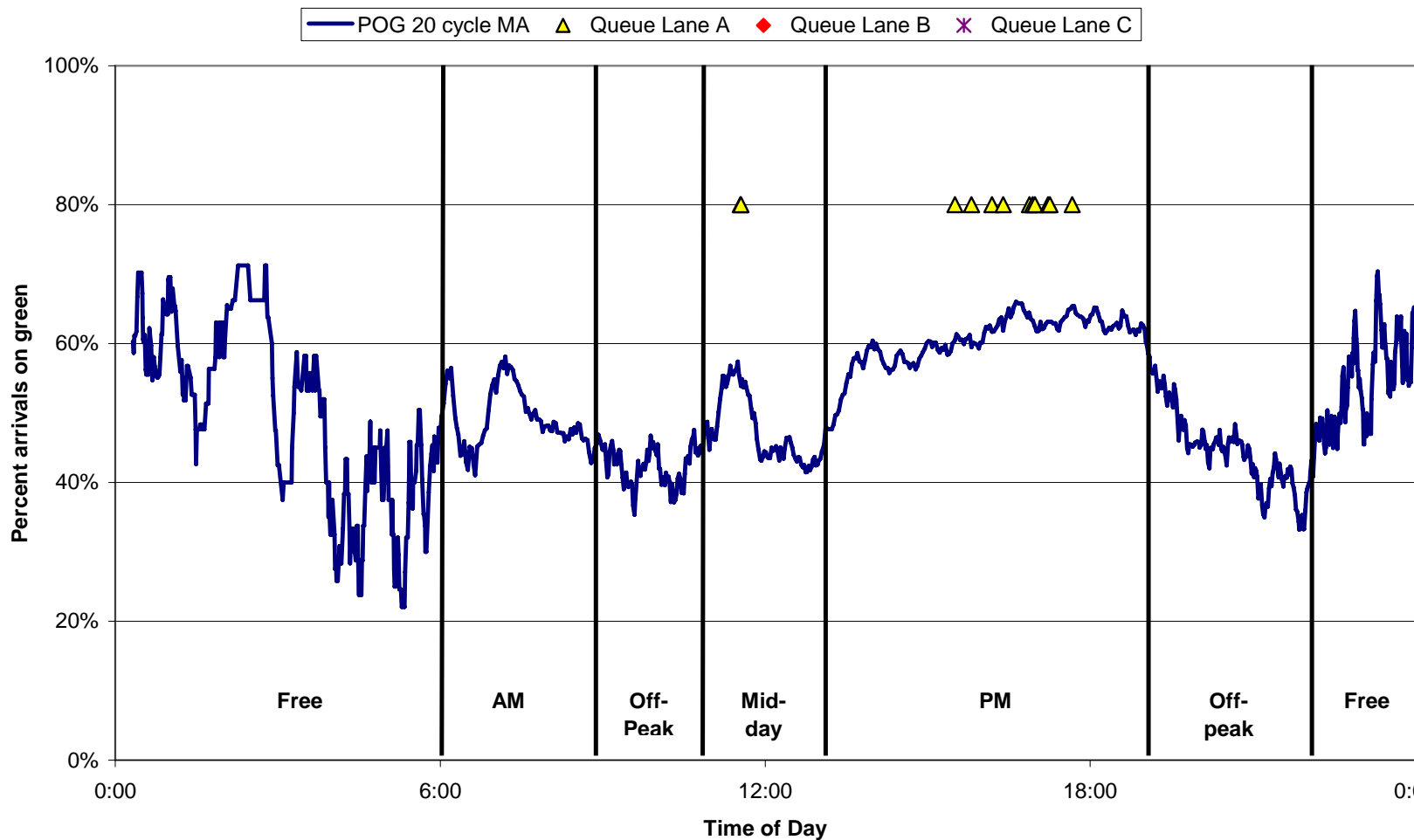


October 18th

October 26th

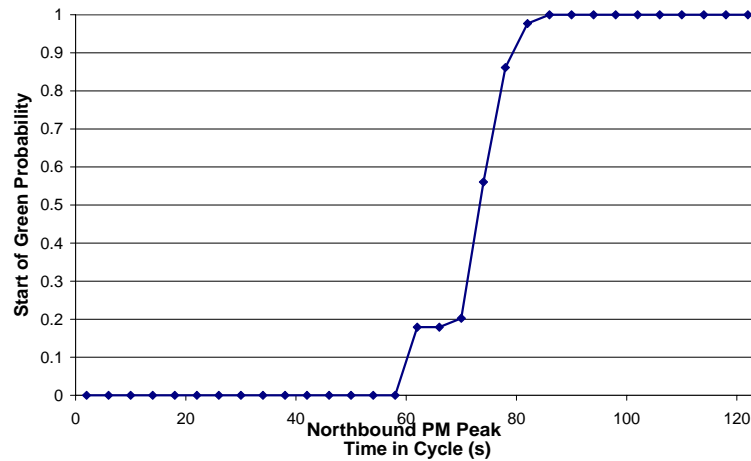


Arrival Type Classification

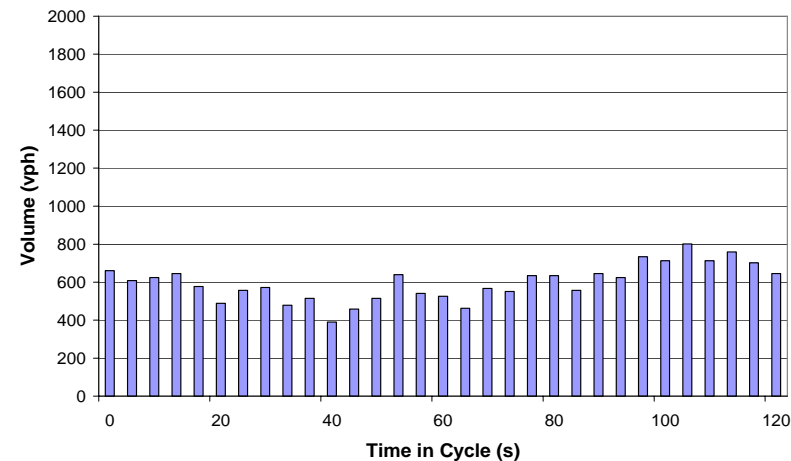
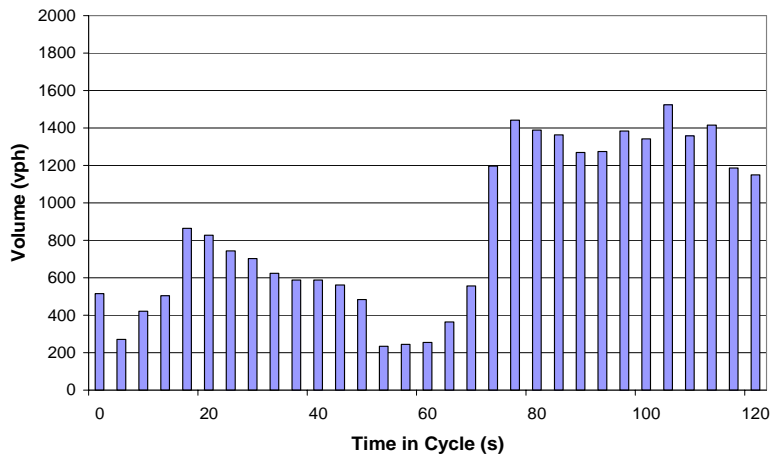
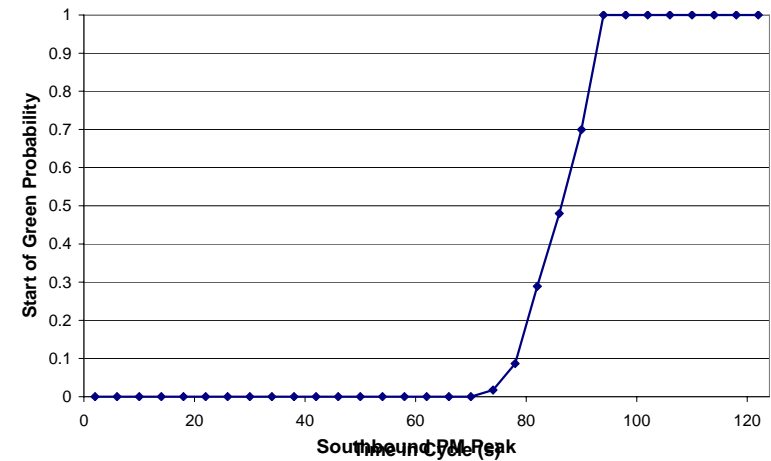


Arrival Type Classification

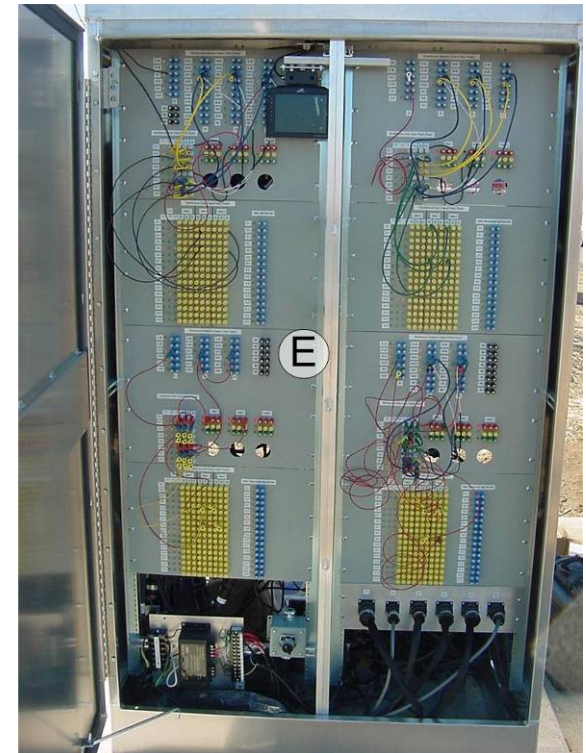
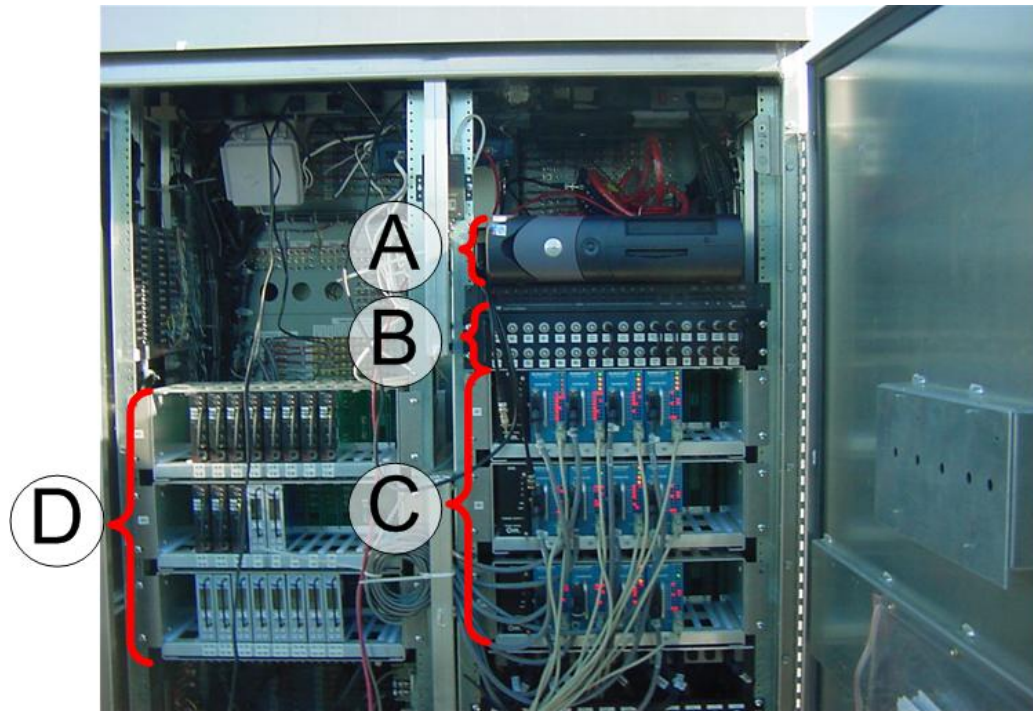
Northbound PM Peak



Southbound PM Peak



Instrumented Intersections



INDOT Initiatives--2006

- What's needed next
 - Concept proven at single intersection
 - Data was gathered using specialized equipment at the instrumented intersections
 - Working on getting this data available at all intersections



Update...2007

- Econolite ASC3
 - FTP server on board
 - .txt file written to server with event data
 - Detector on/off state
 - Interval (red/yellow/green) change events
 - .txt file downloaded and processed



One more step...



Encourage all of INDOT's manufacturers to put it in their hardware, software, etc. so there is no post-processing needed with special programs.

FURTHER THE INDUSTRY



Outcomes (Deliverables)

- Operational

- Have a measurable, quickly quantifiable reason to evaluate our signal systems. Not just because it's been four years.

- Managerial

- Time savers
 - Currently we can gather & analyze data for a few man days to come to the realization that the system is working fine.
- Helps decide where to spend your resources.



Best Practices

- INDOT is thinking of ways we can more easily quantify what we are doing—you should be doing the same.
- Best Practice is to measure your work.
- Don't think of measuring your work as extra work...this is how we get our "at-a-boys".



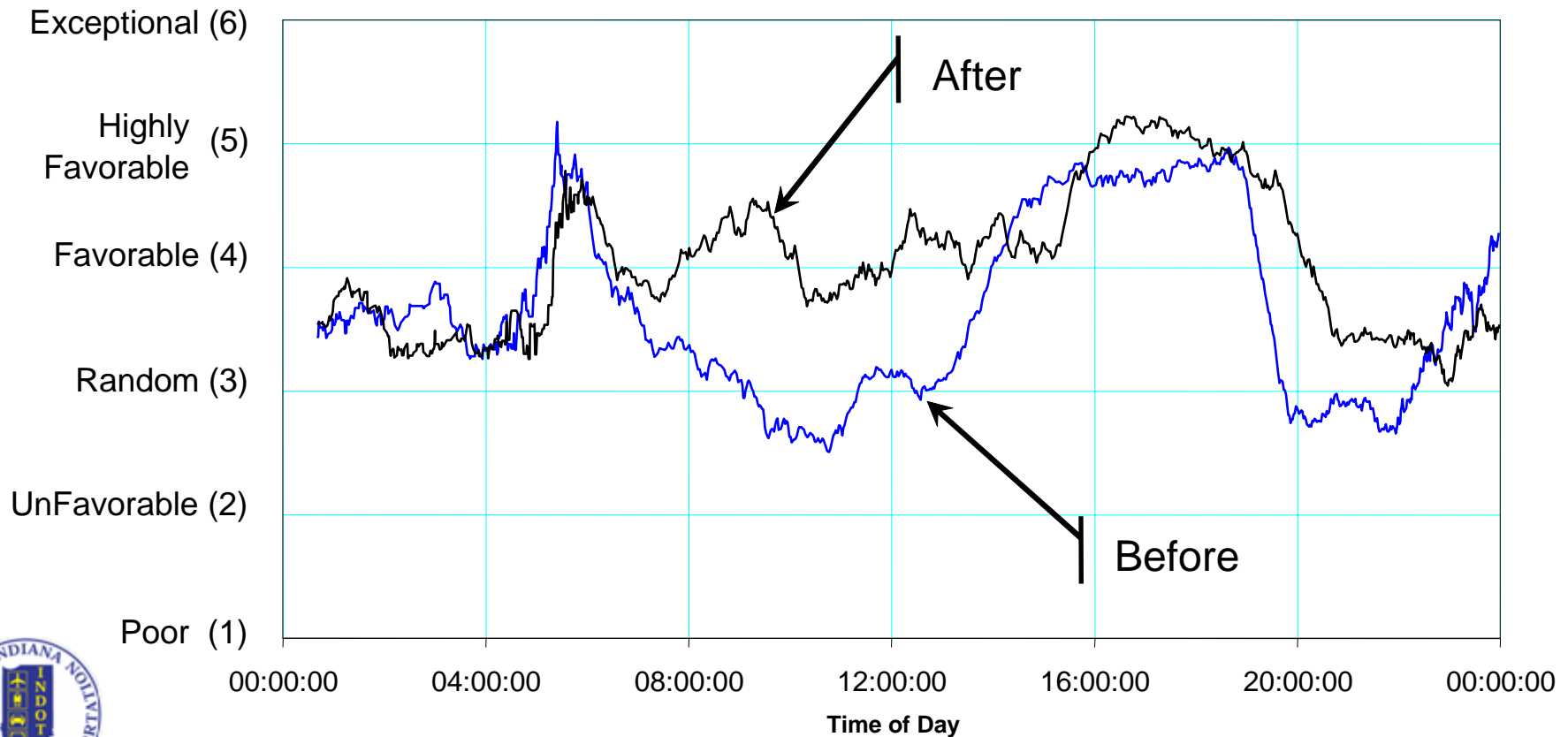
What are the benefits?

- I know...Engineers like numbers and graphs
 - US 31 Columbus
 - [Travel Time Graph \(SB\) \(NB\)](#)
 - [Statistics](#)
 - SR 67 SW Indianapolis
 - [Travel Time Graph \(SB\) \(NB\)](#)
 - [Statistics](#)



Arrival Type Before/After

SR 37 Noblesville, IN—NB at SR 37 & SR 32



Benefit/Cost Calculations

- Many different methods out there...do some research to find one that's best for you.
 - Other State DOT's
 - ITE Journals
 - www.its.dot.gov
 - See Benefit Database and Cost Database
- We chose one that included "admin" costs.
 - Admin Costs = Inside Labor
- Chose to ignore benefits of reducing emissions.
 - Typically small compared to other benefits



Benefit/Cost Calculations

US 36 in Avon, IN				
Implemented August, 2006				



Benefit/Cost Calculations

Cost Summary

Equipment Costs		\$0.00
In-house Labor		\$9,905.06
Outside Services		\$0.00
Total Costs		\$9,905.06

SR 19 in Elkhart, IN
Implemented November, 2006

Benefit Summary

Fuel volume saved(gal/yr)	6003	5481	10701
Fuel cost/gal	\$2.56	\$2.56	\$2.56
Total fuel savings	\$15,367.68	\$14,031.36	\$27,394.56

Total Fuel Savings/yr. \$56,793.60

Time savings per year (hrs.)	5220.0	6786	18792
Value of time (\$/hr.)	\$14.54	\$14.54	\$14.54
Occupancy Factor	1.56	1.56	1.56
Time Savings/yr.	\$118,436.00	\$153,966.81	\$426,369.62

Total Time Savings/yr. \$698,772.43

Benefit/Cost Ratio 76.3



Benefit/Cost Calculations

Synchro File Locations

System Info

Route Description/Cross Street/Direction City/Town District Year Analyzed

Timing Plans

Time of Operation e.g. 0630-0830 "Detailed Network MOE" .txt file location

Timing Plan 1

Before

After

Timing Plan 2

Before

After

Timing Plan 3

Before

After

Timing Plan 4

Before

After

Timing Plan 5

Before

After

Cost/Benefit Parameters

Cost Parameters | Benefit Parameters

Equipment

Item	Quantity	Unit Cost	Sub Total
Controllers	<input type="text"/>	<input type="text" value="2000"/>	<input type="text"/>
Radio Interconnect	<input type="text"/>	<input type="text" value="3500"/>	<input type="text"/>
Cabinets	<input type="text"/>	<input type="text" value="7500"/>	<input type="text"/>
Master Controller	<input type="text"/>	<input type="text" value="3000"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text" value="0"/>	<input type="text"/>

Misc Equipment Costs

If you have additional equipment, enter addition amount here. Alternatively, you can enter total equipment costs here instead of itemizing equipment on the left.

Labor

Position	Hourly Rate	Labor Additive
Technician	<input type="text" value="17.75"/>	<input type="text" value="1.67"/>
Analyst	<input type="text" value="16.40"/>	<input type="text" value="1.67"/>
Systems Engineer	<input type="text" value="35.00"/>	<input type="text" value="1.67"/>
<input type="text"/>	<input type="text"/>	<input type="text" value="1.67"/>
<input type="text"/>	<input type="text"/>	<input type="text" value="1.67"/>
<input type="text"/>	<input type="text"/>	<input type="text" value="1.67"/>
<input type="text"/>	<input type="text"/>	<input type="text" value="1.67"/>

Tasks

Tasks are assigned to positions listed to the left. Each task should be assigned an hourly value as a function of the system as a whole, the number of intersections, the number of timing plans, or a combination of these.
Ex: Time it takes for Construction of the Model [task] is a function of the number of timing plans and the number of intersections in the system.

Misc Labor

Enter additional/total labor here.

Services

Enter total costs for outside labor including consulting and/or contracting labor.

Total Cost

Enter total cost here in lieu of itemizing equipment, labor, and outside services.



■ rgallagher@indot.in.gov

The High Cost of Poor Traffic Operations

- D-...we all own a part of this.
- Best Practices
 - Work proactively
 - Measure your work
- You've seen what benefits can be shown...
- Let me know if we can help
 - Ryan Gallagher
 - rgallagher@indot.in.gov
 - 317-232-5545

